

All the limitations of claim 20 were added to amended claim 18. Various claims were amended to clarify language and more particularly point out what the Applicant regards as his invention.

Claims 1-5 and 18-19, and 21-38 are pending. No new matter has been added by these amendments. All limitations in the amended claims were previously examined. Therefore no further search is needed.

In view of the Office Action, the Applicant would like to review the basic nature of the present invention. This invention is in the field of semiconductor processing. More specifically, the invention discloses a method for electroplating a material onto a semiconductor substrate. The present invention provides a technique for coating a substrate with a liquid material in such a way that the liquid material forms a coating with acceptable thickness uniformity across the substrate while avoiding the use of rotary or other mechanical motion to create a rotational liquid material flow. The liquid material is applied by directing the liquid angularly toward the substrate surface through at least one nozzle so that the liquid material flows rotationally upon contact with the substrate surface. The present invention as claimed eliminates moving parts in the plating enclosure.

Rejections under 35 U.S.C. §102(b)

Claims 1-5 and 18 were rejected under 35 U.S.C. §102(b) as being anticipated by Mori (US 5,443,707). The Applicant respectfully traverses this rejection and requests the Office to consider the following.

To anticipate a claim, the reference must teach every element of the claim. M.P.E.P. § 2131. It is well settled that "[a] claim is anticipated only if each and every

element as set forth in the claims is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil of California, 814 F.2d 628, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). (Cited at M.P.E.P. § 2131).

Mori teaches a process that is described in the Background section of the present invention; that the cathode and the substrate can be rotated by connecting the cathode to a spindle, which in turn is rotated by a motor. The rotating parts feature of Mori is one problem in the prior art that was addressed by the present invention. At column 3, lines 26 et seq., Mori teaches that "[t]he cathode 106 and the semiconductor substrate 107 may be rotated about the vertical axis which is coincident with the extension of the central axis of the mesh-shaped anode 105. This is not what is taught and claimed in the present invention.

The claims require "directing the liquid material angularly toward the substrate surface so that the liquid material flows rotationally upon contact with the substrate surface." (Claim 1). Mori fails to teach or suggest this limitation. In fact, the flow within Mori's device is streamlined plug flow that cannot meet the limitations of the present invention. Mori is directed toward finding a size and shape of the anode 110 in order to achieve the flatter metal film 108. Streamlines depicted in Mori are incorrect and not attainable. The Applicant submits the reference of Transport Phenomena by Bird, Stewart, and Lightfoot, pages 219-220 as an illustration of streamlined flow in a conduit with an expansion. As illustrated in **Fig. 7.5-1**, flow just beyond a right-angle expansion redevelops to a parallel streamlined flow within the conduit. An angled expansion as depicted in Mori will only facilitate the redevelopment of parallel streamlined flow.

Consequently and in contravention to the present invention, Mori's flow is plug flow style that is directed perpendicularly toward the substrate surface. Because Mori does not "teach every element of the claim" M.P.E.P. § 2131, particularly "directing the liquid material angularly toward the substrate surface so that the liquid material flows rotationally upon contact with the substrate surface" (Claim 1), and because "each and every element as set forth in the claims is [not] found, either expressly or inherently described" in Mori, Verdegaal Bros., withdrawal of the rejection is respectfully requested.

Claim 18 has been amended to include the limitation of directing the liquid angularly toward the substrate surface. Withdrawal of the rejection is therefore respectfully requested.

New claims 27-38 all include the same limitations of claims 1 and 18 that are neither taught nor suggested in Mori and are therefore patentable over the prior art.

Rejections under 35 U.S.C. §103(a)

Claims 19-26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Mori in view of Sato et al. (US. 4,981,559). The Applicant respectfully traverses this rejection and requests the Office to consider the following.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claims limitations. The teaching or suggestion to make the

claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. (citation omitted) (M.P.E.P. § 2143. July 1998).

Regarding the first criterion that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, nowhere in Mori, or Sato et al. could one suggest that any problem that one reference is trying to solve is taught in the other reference. In the first place each reference is a different technical area. Mori is involved with critical tolerances in the semiconductor industry with layer thicknesses that are insignificant to Sato et al. Sato et al. is involved in plating calipers or brackets of automobile disk brakes. (Sato et al. at column 1, lines 7 et seq.).

Regarding the limitations of claim 19, the Office Action admits "Mori is silent regarding introducing the plating liquid by spraying the liquid from a plurality of spray outlets." (Office Action at page 5). The Office Action states that "[i]t would have been obvious to one skilled in the art at the time the invention was made to have added the adjustably angled spray nozzles as taught by Sato et al. to the electroplating method as taught by Mori because Sato et al. teach that having adjustably angled spray nozzles for electroplating allows for better coverage and a more uniform film resulting in a more efficient electroplating process." (Office Action at pp. 5-6). Claim 18 as amended, upon which claim 19 depends, requires directing the liquid angularly toward the substrate surface so that the liquid flows rotationally upon contact with the substrate surface. There is nothing in Sato et al. that makes up for the deficiencies of Mori. Sato et al. teaches

exclusively that liquid directed toward his workpieces, Q, are directed perpendicularly according to directional arrows N. The only angularly directed fluid, along directional arrows M, is configured to bypass the workpieces Q in order to accomplish stirring near the anodes 22 at locations opposite the nozzles 11. Withdrawal of this rejection is respectfully requested.

Claim 20 has been deleted and therefore the rejection is mooted.

Regarding claims 21-24, the Office Action admits that Mori is silent regarding the limitations set forth therein. The Office Action then looks to Sato et al. and concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made that the limitations of the claims can be accomplished by application of the teaching of Sato et al. to Mori.

Because the cited references are from such disparate areas, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to combine these references. Because the teaching or suggestion to make the claimed combination cannot be found in the prior art references but only in the Applicant's disclosure, withdrawal of this rejection is respectfully requested.

Regarding the second criterion, there is no reasonable expectation of success in the combination of these references. Because Mori is directed toward rotating a semiconductor substrate with perpendicular plating solution flow and because Sato et al. is directed toward automobile disk brake plating with the only angular flow being directed away from his workpieces Q, there is no reasonable expectation of success in obtaining what is claimed in the present invention. Further, where the claims require that "the liquid

material flows rotationally upon contact with the substrate surface" (claim 1) and where Sato et al. only directs liquid perpendicularly toward his workpieces Q, the combination of Mori with Sato et al. destroys the functionality of the present invention. Further, even if Sato et al. were to teach angular direction of his plating liquid toward his workpieces Q, because they are not simple planar structures like the semiconductor substrates of the present invention, rather complex, undefined, 3-dimensional objects that are totally immersed in the plating liquid, Sato et al. fails to provide a teaching that enables the limitation of the present invention that "the liquid material flows rotationally upon contact with the substrate surface." Withdrawal of the rejection is respectfully requested.

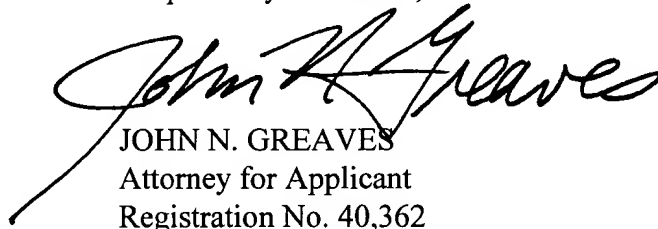
Finally, the prior art reference (or references when combined) must teach or suggest all the claims limitations. Regarding claim 1, there is no combination of the prior art references to teach "directing the liquid material angularly toward the substrate surface so that the liquid material flows rotationally upon contact with the substrate surface." (Claim 1). Because all the claims limitations are not taught in the combination of the prior art references, withdrawal of the rejections is respectfully requested.

In summary, there is no motivation to combine this combination of references to teach what is claimed in the present invention without using the Applicant's disclosure as a guide. There is no reasonable expectation of success to achieve what is claimed outside reference to the Applicant's disclosure. Finally, all of the claims limitations are not taught by any combination of the prior art references. Withdrawal of the rejections is respectfully requested.

The Applicants consider the present application now in condition for allowance and respectfully request that the application be passed to allowance. In the event that the Examiner finds any remaining impediment to a prompt allowance of this application that could be clarified by a telephonic interview, the Examiner is respectfully requested to initiate the same with the undersigned attorney.

DATED this 9th day of March, 2000.

Respectfully submitted,

A handwritten signature in black ink, reading "John N. Greaves". The signature is fluid and cursive, with the first name "John" and last name "Greaves" clearly legible.

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